

REMARKS

The Office Action of January 16, 2004 presents the examination of claims 1, 3, 4 and 7-9. The present paper amends claim 1.

Support for claim amendment

Claim 1 is amended to recite that the inventive golf ball is one having a thermoset polyurethane cover. Such a recitation is supported by the specification at, e.g. page 1, line 3.

Finality of rejection is improper

The Examiner has made the present Office Action final, but this is procedurally improper.

The Examiner has made a new rejection based upon the Ichikawa reference, which has not been previously presented. The Examiner insists that "Applicant's amendment necessitated the new ground of rejection presented in this Office Action", but such is not the case. The Examiner should note that the first Office Action includes a rejection over Kakiuchi:

Kakiuchi produces urethane covered golf balls. The urethane cover has a Shore D of 45-55 (column 4, line 2). The urethane can be base [sic] hexanediol carbonate glycol (column 3, line 37) of 1000-3000 MW (column 3, line 40). This high MW polyol is reacted with diisocyanate and chain extender (column 3, lines 41-53). The chain extenders correspond to applicant's curing agent.

This rejection should be compared with the instant rejection over Ichikawa:

Ichikawa produces urethane covered golf balls. The urethane cover has a Shore D of 38-58 (column 4, line 32). The urethane can be based [sic] hexanediol carbonate glycol (column 3, line 58) of 1000-3000 MW (column 3, line 62). This high MW polyol is reacted with diisocyanate and chain extender (column 3, lines 49). The chain extenders correspond to applicant's curing agent.

It is plain that the present rejection under Ichikawa is identical to the rejection over Kakiuchi presented in the first Office Action. Thus, contrary to the Examiner's assertion, Applicant's amendment did not necessitate the new ground of rejection. Accordingly the making of this Office Action final was improper. Finality of the rejections should be withdrawn.

Rejection over Cavallaro '491

Claims 1, 3, 4 and 7-9 stand rejected under 35 U.S.C. § 102(a) or (e) over Calvallaro '491. These claims also stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cavallaro in view of Murai '691. These rejections are respectfully traversed. Reconsideration and withdrawal thereof are requested.

Applicant has previously presented the Declaration under 35 USC § 131 of Ms. Eriko Kamitami to demonstrate the making of the

invention prior to the filing date of Cavallaro '491. The Examiner has deemed Ms. Kamitami unqualified to make such a declaration, as she is not an inventor of the subject matter of the present application.

As a threshold matter, Applicant submits that the Examiner has improperly interpreted MPEP § 715.07 as requiring that the inventor make a declaration in support of diligence activity. Applicant's Representative would point out that a declaration related to diligence activity can also be made by the patent owner. In the present instance, the Declaration was made by Ms. Kamitami, who was a patent agent acting on behalf of the Assignee.

Notwithstanding that matter, Applicant provides here a Declaration under 35 USC § 131 of Mr. Yokota, the named inventor of the subject matter of the present application. Mr. Yokota's Declaration establishes that he had invented the subject matter of the present application prior to the March 14, 2001 filing date of the Cavallaro reference. Accordingly, the rejections of claims 1, 3, 4 and 7-9 as anticipated by Cavallaro '491, and as obvious over Cavallaro '491 in view of Murai '691, should be withdrawn.

#### Rejection over Kakiuchi

Claims 1, 3 and 4 are rejected under 35 U.S.C. § 102(b) or § 103(a) as anticipated by or obvious over Kakiuchi '286. This

rejection is respectfully traversed. Reconsideration and withdrawal thereof are requested.

Applicant has previously argued that Kakiuchi discloses a golf ball distinct from the presently claimed golf ball in that Kakiuchi utilizes a cover formed from thermoplastic polyurethane. In contrast the cover of the presently claimed golf ball is formed from thermosetting polyurethane. The thermosetting polyurethane used in the present invention provides three-dimensional cross-linking which results in superior mechanical properties not disclosed by Kakiuchi. This basis alone should be sufficient distinction between the invention and reference and accordingly the instant rejection should be withdrawn.

Furthermore, Kakiuchi does not disclose the urethane prepolymer formed by pre-reacting a polyisocyanate and a polyol, the NCO percentage of the prepolymer, the OH/NCO or NH<sub>2</sub>/NCO ratio of the prepolymer. On the other hand, the present claims 3 and 8 recite ranges for these parameters.

The NCO percentage of the prepolymer, together with the OH/NCO or NH<sub>2</sub>/NCO ratio of the prepolymer indirectly determine the specific structure of the resulting polyurethane and its resulting mechanical properties. As Kakiuchi is silent as to values for these parameters, there is no basis for the Examiner to deem the presently claimed golf ball identical to or obvious over the golf

balls disclosed by Kakiuchi. Accordingly, the instant rejection should be withdrawn for this additional reason.

Rejection over Kakiuchi in view of Peter

Claims 1, 3 and 4 are also rejected under 35 U.S.C. § 103(a) as being unpatentable over Kakiuchi in view of Peter '313. This rejection is respectfully traversed. Reconsideration and withdrawal thereof are requested.

The Examiner states that Kakiuchi does not disclose pre-reacting a high MW polyol with diisocyanate, but that such is disclosed by Peter.

Applicant submits that the Examiner fails to establish *prima facie* obviousness of the present invention. Peter does nothing to remedy the basic lack of disclosure by Kakiuchi of either a thermosetting polyurethane cover or ranges for the parameters of the NCO percentage of the prepolymer, the OH/NCO or NH<sub>2</sub>/NCO ratio of the prepolymer. Accordingly, the combination of Kakiuchi and Peter still omits elements of the present claims and fails to suggest any modification of a golf ball to obtain the present invention. Accordingly, the instant rejection should be withdrawn.

Rejection over Ichikawa or Ichikawa in view of Peter

Claims 1, 3, 4 and 7-9 stand rejected under 35 U.S.C. § 102(b) or § 103(a) as anticipated or obvious over Ichikawa '189. Claims

1, 3 and 4 are further rejected under 35 U.S.C. § 103(a) as being unpatentable over Ichikawa in view of Peter. These rejections are respectfully traversed. Reconsideration and withdrawal thereof are requested.

These rejections are stated in the same terms as the rejections over Kakiuchi or over Kakiuchi in view of Peter. Applicant submits that they should be withdrawn for the same reasons as stated above in connection with those rejections.

Like Kakiuchi, Ichikawa utilizes a cover formed from thermoplastic polyurethane. In contrast the cover of the presently claimed golf ball is formed from thermosetting polyurethane. The thermosetting polyurethane used in the present invention provides three-dimensional cross-linking which results in superior mechanical properties not disclosed by Ichikawa. This basis alone should be sufficient distinction between the invention and reference and accordingly the instant rejection should be withdrawn.

Furthermore, like Kakiuchi, Ichikawa does not disclose the urethane prepolymer formed by pre-reacting a polyisocyanate and a polyol, the NCO percentage of the prepolymer, the OH/NCO or NH<sub>2</sub>/NCO ratio of the prepolymer. On the other hand, the present claims 3 and 8 recite ranges for these parameters.

The NCO percentage of the prepolymer, together with the OH/NCO or NH<sub>2</sub>/NCO ratio of the prepolymer indirectly determine the

specific structure of the resulting polyurethane and its resulting mechanical properties. As Ichikawa is silent as to values for these parameters, there is no basis for the Examiner to deem the presently claimed golf ball identical to or obvious over the golf balls disclosed by Ichikawa. Accordingly, the instant anticipation rejection should be withdrawn for this additional reason.

Peter does nothing to remedy the basic lack of disclosure by Ichikawa of either a thermosetting polyurethane cover or ranges for the parameters of the NCO percentage of the prepolymer, the OH/NCO or NH<sub>2</sub>/NCO ratio of the prepolymer. Accordingly, the combination of Ichikawa and Peter still omits elements of the present claims and fails to suggest any modification of a golf ball to obtain the present invention. Accordingly the present invention should not be found obvious over Ichikawa in view of Peter and the obviousness rejection over these references should be withdrawn.

The present application well-describes and claims patentable subject matter. The favorable action of allowance of the pending claims and passage of the application to issue is respectfully requested.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Mark J. Nuell (Reg. No. 36,623) at the telephone number of the undersigned below, to conduct an interview

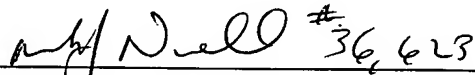
in an effort to expedite prosecution in connection with the present application.

Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), Applicant respectfully petitions for a two (2) month extension of time for filing a response in connection with the present application. The required fee of \$420.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By  #36,623  
Andrew D. Meikle, #32,868

ADM/DRN/mua  
0754-0173P

P.O. Box 747  
Falls Church, VA 22040-0747  
(703) 205-8000

Attachment(s): Declaration under 37 C.F.R. § 1.132





PATENT  
0754-0173P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: Masatoshi YOKOTA Conf.: 9128  
Appl. No.: 10/085,078 Group: 1712  
Filed: March 1, 2002 Examiner: BUTTNER, D.J.  
For: GOLF BALL HAVING A URETHANE COVER

**DECLARATION UNDER 37 C.F.R. § 1.131**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

I, Mr. Masatoshi Yokota, hereby declare as follows:

1. I am the named inventor of the above-identified U.S. Patent Application. I am presently, and at the time the invention of the present U.S. Patent Application was made, employed by Sumitomo Rubber Industries, Ltd. of Hyogo, Japan. I am a Japanese Citizen and I receive mail care of Sumitomo Rubber Industries, Ltd, 6-9 Wakinohamacho 3-chome, Chuo-ku, Kobe-shi, Hyogo, Japan.

2. I am familiar with the prosecution of the above-identified application. The present claims stand rejected at least over Cavallaro et al., U.S. Patent Publication 2002/0177491

A1, published November 28, 2002 from an application filed March 14, 2001.

3. I conceived of the invention at least as early as January 5, 2001. This is shown by the attached Exhibit 11, which is a disclosure of my invention that I prepared and sent to the Intellectual Property Department of Sumitomo Rubber Industries, Ltd. The cover page of Exhibit 11 is the request form of Sumitomo Rubber Industries, Ltd. to proceed with preparing the instant application on January 5, 2001. This date is stamped, with my signature stamp, on the disclosure at the upper right corner of page 1 of Exhibit 11. The cover page is also stamped (signed) by Mr. Atsuro Sumitomo at the middle of the bottom of the page. The date of his stamp is not legible. Exhibit 12 is an English translation of Exhibit 11.

4. The disclosure of the instant Exhibits 11 and 12 is essentially as that of the above-identified U.S. Patent Application. The first page of the disclosure presents three claims as follows:

Claim 1. A golf ball comprising a core and a cover covering the core, wherein the cover contains a polyurethane elastomer including an isocyanate group terminated prepolymer having a polycarbonate polyol as a polyol component and a chain-extender.

Claim 2. The golf ball according to claim 1, wherein the polycarbonate polyol is represented by the following formula.

Claim 3. The golf ball according to claim 1, wherein the polyol has a number-average molecular weight ranging from about 300 to 3000.

The next page of the disclosure describes the prior art and the problem solved by the present invention. The next two pages describe the preferred embodiments of the invention. The described preferred embodiments are almost the same as described in the present U.S. Patent Application.

The next two pages disclose working examples of the present invention. The Examples 1 and 2 of pages 6 and 7 of Exhibit 11 correspond to Examples 1 and 2 of the present invention.

4. Exhibit 13 is a copy of the order letter from Sumitomo Rubber Industries, Ltd. to Sankyo Patent Attorneys Office to prepare and file a Japanese Patent Application. The letter is addressed to Mr. Etsuji Kotani, chief Patent Attorney and is stamped as sent by Mr. Atsuro Sumitomo on January 19, 2001 ("13,1,19"), as shown in the bottom right of the letter, and stamped as received on the same date at the top center of the letter. Exhibit 14 is an English translation of this letter.

5. It is my understanding that a Japanese Patent Application describing and claiming the invention of the instant U.S. Patent Application was promptly prepared by attorneys at Sankyo Patent Attorneys Office. I note that a Declaration Under 37 CFR 1.132 has been made by Ms. Eriko Kamitami of Sankyo Patent Attorneys Office that describes her efforts in preparing and filing this application. On February 28, 2001, I received a first draft of the application referred to a paragraph 5 of Ms. Kamitami's Declaration from Mr. Sumitomo. In the period between February 28 and March 5, 2001, I reviewed that first draft of the application, and conducted additional experiments for working examples and comparative examples. Through Mr. Atsuro Sumitomo,

I provided Sankyo Patent Attorneys Office with corrections to and clarifying comments upon that first draft application. Ms. Kamitami has noted in her Declaration that these corrections and comments were received by her on March 6, 2001.

On March 8, 2001, I reviewed a second draft of the patent application prepared by Sankyo Patent Attorneys Office and again sent my comments upon it back to them through Mr. Atsuro Sumitomo. Ms. Kamitami has referred to these comments also in paragraph 5 of her Declaration Under 37 CFR § 1.132, indicating that she received them on March 14, 2001.

6. The above explanation of facts establishes that I conceived of the invention claimed in the above-identified U.S. Patent Application at least as early as January 5, 2001 and that I worked diligently together with the patent attorneys of Sumitomo Rubber Industries, Ltd. and Sankyo Patent Attorneys Office to prepare and file on March 15, 2001 the Japanese Patent Application upon which the above-identified U.S. Patent Application is based.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: June 4, 2004

Masatoshi Yokota  
Mr. Masatoshi Yokota

Attachments:

Exhibits 11-14

YOKOTA's stamp 内様式1

(改訂1999/10/28)

秘

# 特許出願依頼書

2001 年 1 月 5 日

部長

課長

担当

依頼部門名：(研S)

01-1

山田  
01.1.5  
要

阪  
01.1.0  
上

横  
01.1.5  
田

発 明 分 野

☐タイヤ関連 (T)

☒スポーツ関連 (S)

☐産製品関連 (A)

発 明 の 名 称

ゴルフボール

発 明 の 要 旨  
(50字程度以内)

ポリオール成分がポリカーボネートジオールであるイソシアネート末端プレポリマーと鎖延長剤からなるポリウレタンエラストマーをカバーに用いたゴルフボール

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所属部署  
(グループ名)

(フリガナを必ず記載する)

発明者の氏名

従業員番号  
(必ず記載)

社外人の場合のみ記載 (社員の場合は記載不要)

住所 (フリガナを必ず記載する)

(研S)

(ヨコタ マサトシ)

133809

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横 田 政 利

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事業戦略から見た発明の重要性

☐ 重要性は高い

☐ 早期権利化の必要あり

該当する場合のみチェックを入れる

ダブルチェックも可

出 願 名 義

☒ 住友ゴム単独名義

☐ 共同出願 (共同出願人: )

共同開発契約

☐ 有 (共同開発人: )

☒ 無

公 表 予 定

☐ 有 ( 年 月 日頃 / 公表方法: )

☒ 無

発明の実施段階

☒ アイデアのみ ☐ 設計 ☐ 試作 ☐ 実験 ☐ 製造 ☐ 販売 ☐ 使用 ☐ その他 ( )

自社実施計画

(時期、製品名、

数量などを

記入)

特になし

発明に関連のある

当社先願特許

☐ 有 (SP- )

☒ 無

発明に関する意

匠出願の有無

☐ 出願済み (出願日: , 整理番号: SD- )

☐ 出願依頼中 (依頼日: )

☒ 出願しない

特 記 事 項

"Sumitomo's stamp"

知的財産部 受付印

入力済

01.1.9

知的財産

知的財産部 受付No.

依頼部門名 (コード)

担当

K1010014

研S

佐

01.1.9

コード (5210)

佐

佐  
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永

知財部記入欄

(次の記載事項について不明な点があれば、(知財)の各担当者にご相談下さい。)

## 1. 特許請求の範囲 (請求項)

・ 権利化したい範囲を記載して下さい (本発明が成り立つ上で最低限必要な構造・方法・数値範囲を列挙して下さい)

【請求項1】

→ "claim 1"

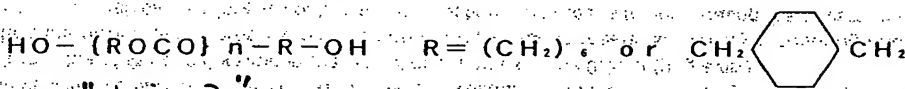
コアと該コアを被覆するカバーからなるゴルフボールにおいて、  
該カバーはイソシアネート末端基プレポリマーと鎖延長剤からなるウレタンエラストマーを含み、  
該プレポリマーのポリオール成分としてポリカーボネートポリオールを用いる。

ポリウレタン

【請求項2】

→ "claim 2"

ポリカーボネートポリオールが下記化学式で表される。



【請求項3】

← "claim 3"

該ポリオールの数平均分子量が約3,000~3,000。

ポリウレタン  
イソシアネート末端基  
鎖延長剤  
ポリカーボネート  
ポリオール

## 2. 現状の説明と先行文献

- ①従来技術（本発明が完成する前はどのような構造や方法が採用または提案されていたのかを記載下さい）
- ②問題点（本発明が解決しようとしている従来技術の問題点を記載下さい）
- ③先行文献（従来技術が記載されている先行特許の番号や文献名を記載下さい）。（文献の写しを添付して下さい）

ゴルフボール用カバー材料としてアイオノマ樹脂が用いられている。アイオノマ樹脂は反発性能に優れているが、打球感やコントロール性に劣る。そこで近年、打球感やコントロール性を改善するためアイオノマに代わってポリウレタンカバーを有するゴルフボールが提案されている。（特許2662909等）この特許記載のウレタンはポリオール成分にポリテトラメチレンエーテルグリコールやポリプロピレングリコールなどのポリエーテルポリオールやポリエチレンアジベートやポリカプロラクトンポリオールなどのポリエステルポリオールを用いている。しかし、ポリエーテルポリオールを用いたポリウレタンは耐熱性や耐候性に劣り、ポリエステルポリオールを用いたポリウレタンは耐加水分解性に劣るため、使用あるいは保管によって物性が低下する問題があった。

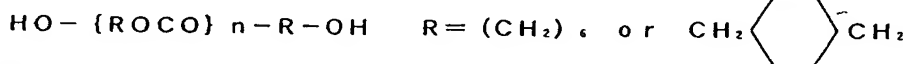


### 3. 本発明の具体的な説明

- ①技術的(改良)ポイント(本発明でテーマとなる部分については特に詳しく説明して下さい)
- ②その他必要事項(本発明を理解する上で必要と考えられる事項について説明して下さい)
- ③効果(本発明によってどういう効果が達成されるのか説明して下さい)

本発明ではポリオール成分にポリカーボネートポリオールを用いることによって、これまで使用されたきたポリオール成分の欠点であった耐熱性、耐候性、耐加水分解性を改善した。

ポリカーボネートポリオール I : 下記化学式で表される。



formula of polycarbonate

Molecular weight

宇部興産(株)製のUM-CARB、UH-CARB、UC-CARBなどが挙げられる。

GPCによって測定した数平均分子量はポリスチレン換算で300から3000が好ましい。300以下では伸び、反撥弾性が低下し、硬度が硬くなりすぎるので打球感、コントロール性が悪くなる。3000以上では高粘度化、高融点化するため、作業性や加工性が低下し、支障が生じる。

所望によりアクリルポリオール、ポリブタジエンポリオール、ポリエーテルポリオール、ポリエステルポリオール等の他種ポリオールを併用しても良い。

Examples of Isocyanate

使用するポリイソシアネートは特に限定しない。4, 4'-ジフェニルメタンジイソシアネート(MDI)、カルボジイミド変成ジフェニルメタンジイソシアネート(液状化MDI)、トリレンジイソシアネート(TDI)、ヘキサメチレンジイソシアネート(HDI)、イソホロンジイソシアネート(IPDI)、シクロヘキサジイソシアネート、キシリレンジイソシアネート、ジシクロヘキシルメタンジイソシアネート、パラフェニレンジイソシアネート、ナフタレンジイソシアネート等が挙げられる。

上記ポリオール I とポリイソシアネートを反応させたプレポリマーとして使用することが好ましい。

プレポリマーの遊離NCO基含有率は3~20wt%が好ましい。3%以下では軟らかすぎる。20%以上では硬すぎる。

Examples of chain extender

鎖延長剤は特に限定しない。3, 3'-ジクロロ-4, 4'-ジアミノジフェニルメタン、メチレンジアニリン、メチレンジアニリンと塩化ナトリウムの錯体、1, 2-ビス(2-アミノフェニルチオ)エタン、3, 5-ジメチルチオ-2, 4-トルエンジアミン、3, 5-ジメチルチオ-2, 6-トルエンジアミン、トリメチレングリコール-ジ-パラ-アミノベンゾエート、ポリテトラメチレンオキサイド-ジ-パラ-アミノベンゾエート等のポリアミン類やエチレングリコール、ジエチレングリコール、プロピレングリコール、1, 4-ブタンジオール、ペンタンジオール、ヘキサジオール、ビスヒドロキシベンゼン、トリメチロールプロパン、ペンタエリスリトール等の水酸基を2~4個有するポリオール類などが挙げられる。これらを単独または混合物として用いることが出来る。

プレポリマーと鎖延長剤の配合比率はNCO基とアミン基あるいは水酸基の当量比が0.8~1.2となるようにすると良い。

NCO / chain extender

その他、3級アミンや有機錫化合物等の触媒や酸化チタン等の顔料、老化防止剤、紫外線吸収剤、光安定剤、蛍光増白剤などを混合しても良い。

前記配合を通常の攪拌能力を備えた配合機にて混合し、コアに被覆、硬化させることによってカバーを作製し、ゴルフボールを得る。混合の方法は限定しないが、気泡を巻き込まないように2液混合吐出機等で十分に攪拌した方がよい。

コアにカバー材料を被覆する方法は特に限定しない。通常は半球状の金型にコアを保持してカバー組成物を注入し、硬化する。

## cover hardness (shore D)

カバー材料として、ボール形状でのカバー硬度はショアDで30~63が好ましい。30未満の場合、耐傷つき易さ、反撥性能が低下する。63超の場合は、打球感が硬くなると共に、スピン性能が低下する。

## cover thickness

カバー厚みは0.5~3.0mm、好ましくは0.7~2.5mmが好ましい。薄い場合は耐久性が低下する。厚い場合は反撥性能が低下する。

## core diameter

コア径は36.8mm~41.8mm 好ましくは 37.8mm~41.4mmが良い。コアは糸巻き、ソリッドのいずれでも構わない。

コアは1層あるいは2層以上のソリッドコアやソリッドセンターやリキッドセンターに糸ゴムを巻いた糸巻きコアを用いることが出来る。

カバーは1層でも良いし、2層以上あっても良い。

本発明のカバー材料は、1層のカバーのみならず、2層以上の内層カバー、外層カバー、あるいは双方に用いることができる。最外層に用いた場合にはディンプルと呼ばれる窪みをつけることが好ましい。また、表面には必要に応じてペイントやマークを施しても良い。

#### 4. 実施例／比較例 (追試できる程度に記載下さい)

- ①実施例と比較例の仕様 (最も広い範囲の請求項を満たすものは自動的に実施例、満たさないものは比較例として下さい。請求項に記載した構造・方法・数値範囲に対して、そのポジションが明確になるように記載して下さい)
- ②製造方法 (具体的な材料名、製造条件、製造装置等を含めて記載下さい)
- ③試験方法 (具体的な試験装置、試験条件を記載下さい) (JIS等の規格があれば、その旨記載して、写しを添付することでも構いません)
- ④試験結果 (実施例が本発明の効果『前記3. ③』を示していることが判るように記載下さい)  
※) 装置・方法などの発明で、実施例／比較例の記載が『3. 本発明の具体的な説明』に入っている場合は、この『4. 』については記載不要です。

##### ◎プレポリマーの合成

###### ・プレポリマーⅠ

4, 4'-ジフェニルメタンジイソシアネート (日本ポリウレタン工業製) とポリカーボネートジオール UH-CARB 100 (数平均分子量 994, 宇部興産製) を配合モル比=4/1で窒素雰囲気下、70°Cで攪拌しながら3時間反応させ、イソシアネート末端ポリウレタンプレポリマーⅠを合成した。プレポリマーⅠのNCO含量は8.8wt%, 数平均分子量は1622であった。

###### ・プレポリマーⅡ

4, 4'-ジフェニルメタンジイソシアネート (日本ポリウレタン工業製) とポリカーボネートジオール UH-CARB 200 (数平均分子量 1987, 宇部興産製) を配合モル比=4/1で窒素雰囲気下、70°Cで攪拌しながら3時間反応させ、イソシアネート末端ポリウレタンプレポリマーⅡを合成した。プレポリマーⅡのNCO含量は8.4wt%, 数平均分子量は2896であった。

###### ・プレポリマーⅢ

4, 4'-ジフェニルメタンジイソシアネート (日本ポリウレタン工業製) とポリテトラメチレンエーテルグリコール (数平均分子量 1962, BASFジャパン製) を配合モル比=4/1で窒素雰囲気下、70°Cで攪拌しながら3時間反応させ、イソシアネート末端ポリウレタンプレポリマーⅢを合成した。プレポリマーⅢのNCO含量は8.1wt%, 数平均分子量は3090であった。

###### ・プレポリマーⅣ

4, 4'-ジフェニルメタンジイソシアネート (日本ポリウレタン工業製) とポリ (エチレンアジベート) グリコール (数平均分子量 2153, 三洋化成工業製) を配合モル比=4/1で窒素雰囲気下、70°Cで攪拌しながら3時間反応させ、イソシアネート末端ポリウレタンプレポリマーⅣを合成した。プレポリマーⅣのNCO含量は8.2wt%, 数平均分子量は3103であった。

##### ◎コアの作製 (Production of core)

BR01	100	JSR製 ハイシスポリブタジエン (シス96%)
アクリル酸亜鉛	30	日本蒸留製 ZNDA90S
亜鉛華	5	東邦亜鉛製 亜鉛華1号
ジクミルパーオキサイド	0.5	日本油脂製 パークミルD

← Zinc acrylate

← Zinc oxide

← Dicumyl peroxide

上記配合物を混練し、160°C30分加熱成形し、直径40mmのコアを作製した。

# ◎ボールの作製

プレポリマーと鎖延長剤としての1, 4-ブタンジオール(BASFジャパン製)を(プレポリマーのイソシアネート基のモル数) / (鎖延長剤の水酸基のモル数) = 1.05となるように混合し、酸化チタン(A100、石原産業製)を攪拌し、粘稠液体のカバー用組成物を得た。これを前記コアを保持した半球状の金型(ディンプル有り)に速やかに注入し、次いでこれを反転して、カバー用組成物を注入した別の半球状金型(ディンプル有り)と合わせて80°Cで15分プレス成形し、硬化を行った。得られたゴルフボールを取り出し、バリ取りした後、表面に白色ペイントとクリアペイントを施して、直径42.8mm、重量45.2~45.7gのゴルフボールを得た。

	実施例 1	実施例 2	比較例 1	比較例 2
プレポリマー	I	II	III	IV
硬度	55	53	52	53
反撥性能 作製直後	100	98	100	95
耐熱試験後	96	95	81	90
耐候試験後	93	92	79	87
耐水試験後	92	90	91	76

working examples 1, 2

Comparative examples 1, 2

← Hardness

Initial repulsion Index

Heat resistance

Weather resistance

Water resistance

硬度：ゴルフボール表面のディンプル山部分を硬度計(ショアD)にて測定。(5点平均)

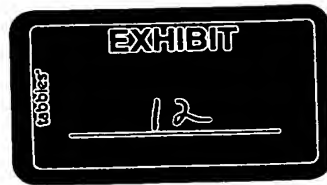
反撥性能：重さ198.4gのアルミニウム製円柱を初速度45m/sで打ち出し、ボールを打撃した際の速度から計算。

実施例1の作製直後を100とした指数で表示。

耐熱試験：70°Cのオーブンに1週間放置後に測定。

耐候試験：サンシャインウェザオメータで120時間照射後に測定

耐水試験：60°Cの水に1週間放置後に測定



Form 1

To intellectual division **Confidential**

revised in 1999/10/28

Request form for <u>filing a patent application</u>		2001/01/05	Manager	Section Manager	Responsible Person
		Division: (Research, S) 01-1	Stamp of YAMADA '01.1.5	Stamp of SAKAGAMI 01.1.0?	Stamp of YOKOTA '01.1.5

Space for the Request Division	Field of Invention		<input type="checkbox"/> Tire (T) <input checked="" type="checkbox"/> Sports (S) <input type="checkbox"/> Industrial material (A)			
	Name of Invention		Golf ball			
	Summary of Invention (within about 50 words)		The golf ball uses a polyurethane elastomer including an isocyanate group terminated prepolymer and a chain-extender, wherein the prepolymer has a polycarbonate diol as a polyol component.			
	Division [group]	[furigana name] Name of Inventor	ID No. (essential)	External person only (unnecessary for the employee) Address [furigana name]		
	(Research, S)	[Yokota Masatoshi] Yokota Masatoshi	133809			
	Strategic Importance	<input type="checkbox"/> Very important      Check an appropriate box <input type="checkbox"/> Necessity of earlier patent right      double check are allowable				
	Applicant name	<input checked="" type="checkbox"/> Sumitomo Rubber only <input type="checkbox"/> Joint application (Joint applicant: )				
	Contract of co-development	<input type="checkbox"/> Yes (Name: ) <input checked="" type="checkbox"/> None				
	Publication Schedule	<input type="checkbox"/> Yes ( Y M D/Method of publication: ) <input checked="" type="checkbox"/> None				
	Phase of the Invention	<input checked="" type="checkbox"/> Idea phase <input type="checkbox"/> design phase <input type="checkbox"/> test <input type="checkbox"/> Experimental <input type="checkbox"/> Manufacture <input type="checkbox"/> Sales <input type="checkbox"/> Use <input type="checkbox"/> Other( )				
	Action plan of the Invention (Time, Product name, volumes, etc.)	None				

	Related prior application	<input type="checkbox"/> Yes (SP- ) <input checked="" type="checkbox"/> None		
	Necessity of Design application	<input type="checkbox"/> Already filed (Date of request: Case No.: SD- ) <input type="checkbox"/> Already requested (Date of request: ) <input checked="" type="checkbox"/> Not necessary		
	Note			Receipt Stamp of Intellectual Division
Intellectual Division	Receipt No. of Intellectual Division	Request Division (Code No.)	Responsible Person	Receipt Stamp of Intellectual Division
	K1010014 01.1.9	Research, S Code( 5210 )	Stamp of SUMITOMO (date is not legible)	'01.1.9 Stamp of MORINAGA '01.1.9.

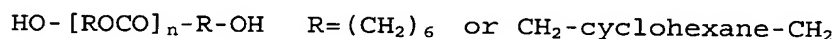
(If any questions about the following descriptions will arise, please contact the person in charge of the intellectual division)

**1. The scope of the inventions (Claims)**

Please describe the scope of the present inventions where you would like to have a patent right. (List up the minimum requirements for constituting the present invention, such as structure, method, and numerical ranges.)

[Claim 1] A golf ball comprising a core and a cover covering the core, wherein the cover contains a polyurethane elastomer including an isocyanate group terminated prepolymer having a polycarbonate polyol as a polyol component and a chain-extender.

[Claim 2] The golf ball according to claim 1, wherein the polycarbonate polyol is represented by the following formula.



[Claim 3] The golf ball according to claim 1, wherein the polyol has a number-average molecular weight ranging from about 300 to 3000.

## **2. The Present status and the Prior Arts**

- (1) Prior Arts (Please describe what kind of structures and methods were used before the establishment of the present invention.)
- (2) Problems (Please describe the problems of the prior arts, which will be solved by the present invention.)
- (3) Prior art documents (Please describe the number of the prior patent documents or the name of the prior literature where the prior arts are described.)

As a cover material for the golf ball, an ionomer resin is used. The ionomer resin is excellent in the repulsion property, but inferior in shot feeling and control. Recently, as an alternative to ionomer resin, polyurethane cover has been proposed in order to improve the shot feeling and control. (Patent No.2662909, etc.) The polyurethane disclosed in this patent uses a polyether polyol such as polytetramethyleneglycol and polypropyleneglycol and a polyester polyol such as polyethylene adipate and polycaprolactone as a polyol component. However, the polyurethane using polyether polyol is inferior in heat-resistance and weather-resistance, and polyester polyol is also inferior in hydrolysis-resistance. Thus, the above conventional polyurethane has a problem that the mechanical properties will be lowered during the use or the storage.

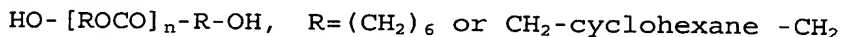


### 3. Specific explanation of the present invention

- (1) Point of the technical improvements. (Please explain the subject matter of the present invention in detail.)
- (2) Additional matters of necessity. (Please explain the necessary matters which are helpful for understanding the present invention.)
- (3) Effect (Please explain what effect is given by the present invention.)

In the present invention, use of the polycarbonate polyol as a polyol component improves the heat-resistance, weather-resistance, and hydrolysis-resistance, which are the deficiencies in the conventional polyols.

Polycarbonate polyol I: represented by the following formula



Examples of the polycarbonate polyol include UM-CARB, UC-CARB available from UBE INDUSTRIES, LTD.

The polycarbonate polyol preferably has a number-average molecular weight of from 300 to 3000, in a polystyrene-converted value measured by GPC. If the molecular weight is not more than 300, the repulsion will be lowered, and the shot feeling and the control will be deteriorated due to the excessive hardness. If the molecular weight is not less than 3000, the polycarbonate polyol will have higher viscosity and higher melting point, resulting in lower workability.

The other polyols such as acrylic polyol, polybutadiene polyol, polyether polyol, polyester polyol may be used together with the polycarbonate polyol where necessary.

The polyisocyanate includes, without limitation, diphenylmethane diisocyanate (MDI), carbodiimido-modified diphenylmethane diisocyanate (liquid MDI), toluene diisocyanate (TDI), hexamethylene diisocyanate (HDI), isophorone diisocyanate (IPDI), cyclohexane diisocyanate, xylylene diisocyanate (XDI), dicyclohexylmethane

diisocyanate, paraphenylene diisocyanate (PPDI), naphthylene diisocyanate and the like.

The above polyisocyanate and the above polycarbonate polyol are reacted to obtain the prepolymer, and the resultant prepolymer is preferably used.

The prepolymer preferably has free NCO content of 3 to 20 wt %. If the NCO content is not more than 3 %, the resulting polyurethane is too soft, while if the NCO content is not less than 20 wt %, the resulting polyurethane is too hard.

The chain-extender includes, without limitation, a polyamine such as 3,3'-dichloro-4,4'-diaminodiphenylmethane, methylenedianiline, a complex of methylenedianiline and sodium chloride, 1,2-bis(2-aminophenylthio)ethane, 3,5-dimethylthio-2,4-toluenediamine, 3,5-dimethylthio-2,6-toluenediamine, trimethylene glycol-di-p-aminobenzoate, and polytetramethyleneoxide-di-p-aminobenzoate, and a polyol having 2 to 4 hydroxyl groups such as ethylene glycol, diethylene glycol, propylene glycol, 1,4-butanediol, pentanediol, hexanediol, bishydroxybenzene, trimethylolpropane, and pentaerythritol. The above chain-extender can be used individually or as a mixture thereof.

Mixing ratio of the prepolymer and the chain-extender is preferably such that the equivalent ratio of the total of the amino group and hydroxyl group to NCO group ranges from 0.8 to 1.2.

Further, a catalyst such as a tertiary amine, organic tin compound, a pigment such as titanium oxide, an anti-oxide, a UV-absorber, a light-stabilizer, a fluorescent brightener may be mixed.

The polyurethane cover composition is mixed using a mixer having a typical stirring ability, and is coated onto the core and then cured to obtain the golf ball having the cover. Though there is no limitation on mixing process, it is preferred that the polyurethane cover

composition be sufficiently stirred by the use of a two-part resin mixing dispenser or the like so as not to include air therein.

There is no limitation on the process for covering the core with the polyurethane cover composition. The polyurethane cover composition is conventionally injected into a hemispherical mold holding a core, and allowed to cure therein.

The cover preferably has a Shore D hardness of from 30 to 63 in a state of the ball. If the hardness is less than 30, the abrasion-resistance and the repulsion will be lowered, while if the hardness is more than 63, the shot feeling will be hard as well as the spin property will be deteriorated.

The cover preferably has a thickness of 0.5 to 3.0mm, more preferably a thickness of 0.7 to 2.5 mm. If the cover is too thin, the durability will be lowered, while if the cover is too thick, the repulsion will be lowered.

The core preferably has a diameter of 36.8 mm to 41.8 mm, more preferably a diameter of 37.8 to 41.4mm. The core may include a wound-core and a solid core.

The core may include a solid core having a single layered structure or at least two-layered structure, or a wound core which is obtained by winding a solid center or a liquid center with a thread rubber.

The cover may be single-layered cover, or at least two-layered cover.

The cover composition of the present invention can be applied to either or both of the inner and outer cover of at least two-layered cover. When used as an outer most cover, the cover is preferably formed with dimples. Further, the golf ball is preferably provided with paint finish, and a marking stamp where necessary.

**4. Examples / Comparative Examples** (Please describe in such a way that the person can carry out the present invention.)

(1) Working Examples and Comparative Examples (Working examples should meet with the requirements of the broadest claim. Comparative examples fail to meet with the requirements of the broadest claim. Please clarify the meanings of each example, in accordance with the structure, method, numerical range defined in the claims.)

(2) Process for preparing (Please describe the name of specific material, equipments used, and conditions.)

(3) Method for evaluating (Please describe the specific equipments and the conditions.)

(4) Results of evaluation (Please describe in such a way that the working examples satisfy the effects described in 3. (3).)

\*) In the case that the present invention relates to the equipment and the process and that the description of "Examples / Comparative Examples" has been included in "3. Specific Explanation of the present invention", it is not necessary to describe it again.

#### ©Synthesis of Prepolymer

##### Prepolymer I

4,4'-diphenylmethane diisocyanate (produced by Nippon Polyurethane Industry Co.) was mixed with a polycarbonate diol UH-CARB1000 (Number average molecular weight: 994, produced by UBE Industries), so that the equivalent ratio between the NCO group and the OH group (OH/NCO) is 1/4. The resulting mixture was reacted at 70°C for three hours in a nitrogen atmosphere while being stirred to obtain an isocyanate group-terminated urethane prepolymer I. The prepolymer I has NCO content of 8.8 wt%, and a number average molecular weight of 1622.

##### Prepolymer II

4,4'-diphenylmethane diisocyanate (produced by Nippon

Polyurethane Industry Co.) was mixed with a polycarbonate diol UH-CARB2000 (Number average molecular weight:1987, produced by UBE Industries), so that the equivalent ratio between the NCO group and the OH group (OH/NCO) is 1/4. The resulting mixture was reacted at 70°C for three hours in a nitrogen atmosphere while being stirred to obtain an isocyanate group-terminated urethane prepolymer II. The prepolymer II has NCO content of 8.4 wt%, and a number average molecular weight of 2896.

#### Prepolymer III

4,4'-diphenylmethane diisocyanate (produced by Nippon Polyurethane Industry Co.) was mixed with a polytetramethyleneetherglycol (Number average molecular weight:1962, produced by BASF Japan), so that the equivalent ratio between the NCO group and the OH group (OH/NCO) is 1/4. The resulting mixture was reacted at 70°C for three hours in a nitrogen atmosphere while being stirred to obtain an isocyanate group-terminated urethane prepolymer III. The prepolymer III has NCO content of 8.1 wt%, and a number average molecular weight of 3090.

#### Prepolymer IV

4,4'-diphenylmethane diisocyanate (produced by Nippon Polyurethane Industry Co.) was mixed with a poly(ethyleneadipate)glycol (Number average molecular weight:2153, produced by Sanyo Kasei), so that the equivalent ratio between the NCO group and the OH group (OH/NCO) is 1/4. The resulting mixture was reacted at 70°C for three hours in a nitrogen atmosphere while being stirred to obtain an isocyanate group-terminated urethane prepolymer IV. The prepolymer IV has NCO content of 8.2 wt%, and a number average molecular weight of 3100.

©Manufacture of core

BR01	100	JSR, high cis polybutadiene(cis 96%)
Zinc acrylate	30	Nippon JYORYU CO.
Zinc oxide	5	Toho Zinc, Toho zinc oxide No.1
Dicumyl peroxide	0.5	NOF Corp. Percumyl D

The above composition was kneaded and molded at the heating condition of 160 °C for 30 mins. to obtain the core having a diameter of 40 mm.

©Production of Golf ball

The prepolymer was mixed with 1,4-butanediol (produced by BASF JAPAN Co.) as the chain-extender so that the equivalent ratio of the isocyanate group of the prepolymer to the hydroxyl group of the chain-extender to (NCO/OH) is 1.05. Further, titanium oxide(A100, Ishihara Sangyo) was added to give a cover composition in a viscous liquid state.

The cover composition thus prepared was injected into a hemispherical mold formed with convex portions for forming dimples in which the previously manufactured core was held, and then this mold was inverted and mated with another hemispherical mold (also formed with convex portions for forming dimples) containing the cover composition injected thereinto, followed by press molding at 80°C for 15 minutes for the composition to cure.

After the curing, the resulting golf ball was removed from the molds, deburred, and then coated with a white paint and further with a clear paint to obtain golf balls having a diameter of 42.8 mm and a mass of 45.2 to 45.7 g.

	Ex. 1	Ex. 2	Com. Ex. 1	Com. Ex. 2
Prepolymer	I	II	III	IV
Hardness	55	53	52	53
Initial Repulsion Index	100	98	100	95
Heat-resistance	96	95	81	90
Weather-resistance	93	92	79	87
Water-resistance	92	90	91	76

Hardness: The hardness of non-dimpled portion of the surface of the golf ball was measured by applying a hardness tester (Shore D type). (average of 5 portions)

Repulsion: An aluminum cylindrical body having a weight of 198.4 g was allowed to impinge upon the golf ball at the velocity of 45 m/sec. The repulsion was calculated from the velocities and represented as an index number assuming that the initial repulsion index of example 1 is 100.

Heat-resistance: measured after keeping in an oven at 70 °C for one week.

Weather-resistance: measured after irradiating for 120 hours in a sunshine weatherometer.

Water-resistance: measured after keeping in a water at 60°C for one week.

三  
所



28307



← "receipt stamp"

第 P-SM-1-11 号

2001年1月18日

神戸市中央区脇浜町3丁目6番9号

住友ゴム工業株式会社

知的財産部長 伊勢木 敏



(担当-住友教郎)

Document "A"

## 国内特許・実用新案出願依頼書

Responsible person is

拝啓 時下益々ご隆盛のことお慶び申し上げます。

さて、標記に関し下記の内容で出願手続をお願い申し上げます。

Mr. "Sumitomo"

敬具

【記】

特許／実用新案の種別	○ 特許 /	実用新案
発明の名称（仮称）	ゴルフボール	
弊社整理番号	K1010014 /	
審査請求の要否	要 ○否（但し、出願時）	
請求項の数	3 /	
希望案文納期	2001年2月9日 /	
<p>【備考欄】</p> <ul style="list-style-type: none"><li>・発明内容は、 添付①・・・発明者の出願依頼書 添付②・・・知財部 <del>ヨメ</del> の管内に発明者回答 をご参照下さい。</li><li>・関連先行技術（適宜明細書中に挙げて下さい。） (1). 特開平4-241881（添付③） （添付④の、特許2662909の公開公報）</li><li>・添付資料 資料A・・・ウレタンの一般的性質の資料 資料B・・・実施例記載のポリオールのカatalog</li></ul>		

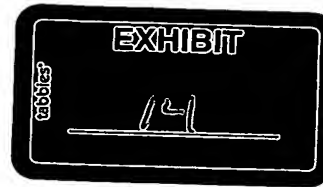
〔追伸〕発明内容に不明の点があるとき、又は、上記納期に間に合わない場合、予め早めにお知らせください。なお、出願明細書の写しは2部お送り下さい。

← Person responsible for this case

Mr. Sumitomo's stamp

担当	課長	業務





Sankyo Patent Attorneys Office  
Chief Patent Attorney,  
Etsuji Kotani

No. P-SM-1-11  
January 18, 2001

Receipt Stamp "13,1,19"

6-9, Wakinohamacho, 3-chome, chuo-ku, Kobe-shi  
Sumitomo Rubber Industries Limited

Director of Intellectual property division,

Toshi ISEKI

(Person in charge: Atsuro SUMITOMO)

Order letter for filing an application of domestic patent/Utility model

Dear Sir, I'm glad to hear that things are going well for you.  
Now, please prepare the application based on the following instructions,  
concerning the identified case.

Patent or Utility model	<input type="radio"/> Patent	Utility model
Name of the Invention (provisional title)	Golf ball	
Company's reference number	K1010014	
Request of examination	Yes <input type="radio"/> No (when filing)	
Number of claims	3	
Due date of a draft	February 9, 2001	
<p>[Note]</p> <p>Please refer to the following attachments for the present invention.</p> <p>Attachment 1: Request form of the inventor</p> <p>Attachment 2: Questions of Intellectual property division and answers from the inventor</p> <p>Related Prior Arts (Please describe the following prior arts in the specification appropriately)</p> <p>(1) Japanese unexamined patent publication No. H04-241881 (Attachment 3)</p> <p>(the unexamined patent publication of patent No. 2662909, attachment 4)</p>		

Attached materials

Material A: literature showing general properties of polyurethane

Material B: catalog of polyol used as the working examples

[Postscript]

Please let us know ahead of the due date, if the preparation of the draft is not in time for the above due date. Further, please send us two copies of the specification.

Person in charge	Section Manager	Operator
Stamp of SUMITOMO dated of 01,1,17	Stamp of KATO dated of '01,1,18	Stamp of MORINAGA dated of '01.1.18

CERTIFICATION

I, Osamu FUTAKUCHI, whose address is Fujita-Toyobo Building 9F, 1-16, Dojima 2-chome, Kita-ku, Osaka, Japan, hereby certify that I am the translator of the attached documents, namely,

EXHIBIT11: In-house Request form of Sumitomo Rubber Industries, Ltd. for a patent application.

EXHIBIT13: External Request form of Sumitomo Rubber Industries, Ltd. for a patent application.

that I am familiar with both the Japanese language and the English language, and that the translation is a true and correct translation from the Japanese language to the English language to the best of my knowledge and belief.

This 14th day of June 2004

  
Osamu FUTAKUCHI